Boeotian landscapes. A GIS-based study for the reconstruction and interpretation of the archaeological datasets of ancient Boeotia.

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I.1

Regional approaches to landscape studies

In undertaking the study of a regional landscape, one ought to explore the possible ways according to which the historical landscape of a region can be approached, and the landscape marks of past transformations can be read and interpreted. In this chapter I will examine the meaning of key concepts, such as *region* and *landscape* and related notions, and I will explore several approaches to regional landscape studies which concurred and contributed to the developing of the approach I followed in my examination of the historical landscape of ancient Boeotia.

THE GEOGRAPHICAL AND ARCHAEOLOGICAL APPROACHES TO *REGION* AND *LANDSCAPE*

REGION

As contemporary geographers state, the concept of *region* is relatively clear, compared with many troublesome social science concepts. Vance defines the region as "*a homogeneous area with physical and cultural characteristics distinct from those of neighbouring areas*" (Vance and Henderson 1968: 377), and his definition is close to that of Vitkovsky and Kolossov (1980: 539) as "*a complex spatial socioeconomic system, characterized by a stable combination of political forces and possessing a specific complex of features*". As the political geographers Janda and Gillies (1983) point out, perhaps the most critical issue in conceptualising a region revolves around the requirement of geographical contiguity[1].

What is defined is the region in contemporary terms, primarily as an object of study for political and economic issues within human geography. In fact, the concept of region itself can be considered as having been born very much earlier within the discipline of geography.

Regional geography finds its origins in the 19th century, influenced by Darwin's work (*Origin of Species*, published in 1859), which broke the links between geography and natural theology and caused rejection of geographical work based on teleological approaches, laying the groundwork for new ways of conceptualising the relationship between people and their environment, and heightening interest in the region as a subject for geographical enquiry (Humboldt and Ritter[2]). Darwin's impact provided fresh stimulation for the doctrine of environmental determinism, according to which human activities are controlled by the environment. This would explain the pattern and processes of human habitation of the earth's surface, and what must be analysed are the effects of the natural environment on the human body and spirit of both individuals and entire social groups, as the work of F. Ratzel[3], for instance, attests.

Afterwards, regional geography developed from 19th-century origins in different directions. In the United States, regional geography is seen as a descriptive rather than a systematic study, while in Europe, regional geography can combine both aspects. In France, in particular, regional geography came to be associated with the work of Vidal de la Blache, who approached the concept of region from its human and cultural dimensions[4], seeing the region as the unique expression of the interaction between humanity and the physical environment (see Vallega 1999; Agnew et al. 1996). Regional approaches, initially very much influenced by environmental determinism, slowly moved within geographical studies in other directions, allowing for the study of the interaction between people and the environment without seeing causal links between the two, and offering human geographers a clear and well-defined object of study, having as key themes the concept of region and the interaction between peoples and

[1] Although many contemporary geographers do not require contiguity in defining a region (Russet 1967: 2-7; Vance and Henderson 1968: 378; Cox 1969: 71, 77), especially when considering the international and global sphere, in studying antiquity I believe that geographical contiguity has to be applied as a criterion in defining a region's boundaries, as scales are certainly smaller and interconnection processes much more localised.

[2] Alexander Von Humboldt (1769-1859; his work was *Kosmos*, 1845-1862, subtitled *Sketch of a Physical Description of the World*) and Carl Ritter (1779-1859; his unfinished work was *Erdkunde*, 1822-1859) developed regional and systemic approaches and laid the foundations for geography as a specific branch of knowledge based on scientific methods of enquiry, though still influenced by teleological approaches.

[3] Friedrich Ratzel (with his first work *Sein und Werden der organischen Welt*, 1869) can be considered the founder of environmental determinism in geography, and a pioneer in anthropogeography, which had three main aims: to describe the regions of the *ecumene* –habitable earth- and the distribution of mankind over it; to study human migratory movements of all types and their dependency on the land; to analyse the effects of the natural environment on the human body and spirit, both on individuals and entire social groups.

[4] Vidal de la Blache (1845-1918), one of the founders of modern geography, developed three key concepts for the understanding of regional geography: *milieu*, *genre de vie*, *circulation* (*Principles de géographie humaine*, 1922).

environments; in this way radically changing the discipline[5].

LANDSCAPE

The word 'landscape' comes from the Dutch term *Landschap* and was borrowed by painters in the 16th century (Thomas 1984). Through the painted representations, *landscape* becomes "*something out there, to be appreciated in visual terms and constructed through the rational principles of perspective. Distanced geometrical images of landscape were reinforced by cartography* […] *Landscape was not lived, but looked at, being seen as something external to people; nature versus their culture*" (Gosden 1999: 153). Initially, the landscape was therefore seen as a representation, either as a picture, or as a map. Still, the geographers Cosgrove and Daniels (1988: 1) define landscape as "*a cultural image, a pictorial way of representing, structuring or symbolising surroundings*".

Subsequently, focus was placed upon the binomial nature and culture within the landscape, and as such, the geographer Roberts (1987) defines the landscape as a set of real-world features, natural or cultural, which give character and diversity to the earth's surface. In more recent approaches, influenced by phenomenology, more and more focus has been given to the landscape as an holistic, all-embracing concept, definable as a dynamic and continuously transforming (in process) synergy of physical/natural and human/cultural factors mutually interrelating, within which, in the anthropologist Ingold's words (2000: 191), "*each component enfolds within its essence the totality of its relations with each and every other*"[6].

Also underlined within anthropological studies is the qualitative and holistic nature of the concept of landscape, not being an empty box prepared in advance for creatures to occupy and in which life and actions simply take place, but rather constituted by the unfolding of mutual interrelation between 'nature' and 'culture' (see among others Gosden 1999: 153ff; Ingold 2000: 199 and *passim*, within the phenomenological trend) [7].

In archaeological studies, landscape in archaeology was pioneered by Crawford and Fox in the 1920s-30s in Britain[8]. In America, in the 1960s, the archaeologists benefited from the emergence of ecology[9] and became involved in modelling subsistence, settlement, and culture change utilising an ecological perspective (Hassan 2004). That fitted with the objectives of the New Archaeology, within which, also in the 1960s, landscape entered the domain of archaeology in the form of spatial analysis, focusing on quantitative analysis of the distribution of sites and artefacts within space (Clarke 1977; Hodder and Orton 1976). More recently, approaches to landscape have represented a movement against spatial analysis, rejecting the risk of environmental determinism and stressing instead the mutual creation of people and landscape[10] (see below) and the notion of cultural experienced landscape, which was soon influenced by Heidegger and phenomenology, looking at the lived experience of landscapes (Ingold 1993 and then Ingold 2000, Gosden 1994, Tilley 1994).

Landscape archaeology at first looks mainly at the spatial relationships of artefacts and features in order to infer the past use of landscape, and later on delves further into the mutual interrelationships of natural and cultural characters and processes in order to infer meanings of ancient landscapes, considering the landscape not as a passive recipient of human activities, but as a dynamic and interactive element in the evolution of past societies (Roberts 1987; Fleming 1990; Kuna et al. 1993; Tilley 1994; Knapp and Ashmore 1999; Wilkinson 2004), and a spatial manifestation of the relations between humans and their environment. Landscape archaeologists deal mainly with the interpretation and the reconstruction of human behaviour over space through time[11].

The two concepts illustrated above (*region* and *landscape*) come together whenever research is carried

[5] Agnew et al. 1996; Johnston 1991; Paasi 1991. Contemporary regional studies in geography involve: Historical and thematic approaches to regional structure; theory of the region; the origin and development of regional character; locality and place-making; nature and culture in regional settings; comparative study of regions.

[6] Contemporary landscape studies in geography involve: Landscape as an embodiment and shaper of social values and attitudes towards environment; theories of landscape structure and change; the historical development and regional construction of landscapes; thematic landscapes; landscape character; the role of institutions in environmental design and management; aesthetic landscape values; landscape and the sense of place; comparative landscape analysis.

[7] In anthropological studies, the notion of the cultural (or social) landscape goes back to Sauer (1963).

[8] O.G.S. Crawford represented the evolutionist-diffusionist school of thought in British archaeology, according to which the analogy and cause-and-effect relations in the interpretation of spatial arrangements was stressed out and discontinuity in the emergence of new cultural forms was often explained in terms of migration. His clearly positivist approach to archaeology regarded archaeological sources as objective, and lead him to form and formulate the principles of the application of aerial photography in archaeology. He was the pioneer of the use of aerial photography to enhance the archaeological understanding of the landscape. Sir Ciril Fox, inspired by Crawford, gave rise to a new trend called landscape archaeology, which chose aerial photographs to be its key source of information, also introducing a new perspective to the studies of past agriculture (based on the changeability of field systems) and showing how the pattern of settlement had changed in relation to natural vegetation in his archaeology of the Cambridge region (1923) (see on this Evans 1999 and 2003).

[9] Odum's *Fundamentals of Ecology* appeared in 1953.

[10] Bordieu is influential at this point, with landscapes and *habitus* being seen as mutually creative (see below in text). Bordieu's *habitus* is a term compounded from *habitude* (habit or custom) and *exis* (acquired ability or facility).

[11] 'How' and 'why' human behaviour changes over space and during time, the dynamics which occur… (Van Leusen Pattern to Process 2002: 5.12). "*Space, time and function can be thought of as different axes along which the available data can be differentiated*" (Van Leusen Pattern to Process 2002: 5.13).

out on the *landscape* of a *region* (either macro-region or micro-region). In the history of the archaeological discipline, along with geography (mainly; and anthropology later), one encounters several different landscape study traditions, which, to varying degrees, involve the focusing on regional patterns, trends and dynamics.

In archaeological research, interest in micro-regions, and consequently in micro-landscapes, seems to have been strong during the final decades of the 19th century (and in the first half of the 20th), within the framework of the German *Landeskunde* tradition (Jahnkuhn 1955). This probably occurred because past societies, the objects of archaeological studies, were based on rural economies as well as Southern European society in the 19th and the beginning of the 20th century. Rural communities still lived then according to micro-regional settlement organisations, and therefore archaeologists somehow naturally tended to focus their research on past societies around micro-landscapes. Within this framework and social context the concept of *Siedlungskammern*, settlement chambers, originated, which was then borrowed by geographical studies.
In modern times, economic geography, moving from the study of a principally rural economy to the study of much more differentiated economic processes (industrial-demographic planning, as well as the even wider service – tertiary - network), gave higher value to the wider regional trajectories, and this also led human geography to a different dimension in its approach to the landscape, moving from the micro-regions to wider regional and broader systems. Therefore, within human geography, focus was given mainly to the concept of macro-region (vs. micro-region), primarily because human behaviour and social and economic life had changed. Only physical geography still remained interested in micro-landscapes.

On the other hand, the management of heritage (cultural, historical, and archaeological) landscape has recently become a relevant issue as one of the European Union's strategic actions, and the latest trend is therefore to give emphasis to historical landscape conservation/preservation and management (Grenville 1999). It can be noted how, with the decline of farming, landscape is still identifiable with environmental interest (nature, leisure resource), but also with the need to document our farming past which is quickly disappearing[12]. In this perspective, the heritage landscape means something more than landscape of sites, and it is the region that has to be preserved rather than the individual historical-archaeological sites. The regions involved in this preservation, however, are mainly micro-regions, on which the rural landscape to be preserved was based. We therefore assist in an increased attention to landscape environmental and historical problems, and to the production of sub-regional historical maps, aiming to help the monitoring, and therefore the preservation, of historical landscapes (successful examples are, for instance, some areas in the United Kingdom: Landscape Character Assessment programme – LCA – Bell 1999, Hughes and Buchan 1999, Gustavsson 1999, Scottish Executive 2000; and in the United States[13]). Landscape heritage has thus become a new issue, and its introduction and developments have helped in some way to bring archaeology and geography together once again in their common renewed interest in small landscapes whose character ought to be preserved. In this heritage management perspective, the individuation and preservation of landscape character is enlightened[14] (Grenville 1999 among others), and archaeology and anthropology both argue on it. Tilley (1994: 25-26) refers to 'qualities' of landscape, that create part of their significance for those who use them and are constituted by 'locales'. The anthropologist Ingold, interested in archaeological issues also through his concern for the temporality of the landscape (Ingold 1993), in his main work gives a definition of 'landscape character' (landscape 'form' - Ingold 2000: 193, see below). The concept of 'landscape character' becomes a bridge between landscape and region (micro-region).

REGIONS AND MICRO-REGIONS IN THE READING OF THE GREEK LANDSCAPE

As noted by Bintliff (2000a: 148), the reading of Greek landscapes was achieved by the German *Landeskunde* tradition of historical geography between the final decades of the 19th century and the 1950s (Jahnkuhn 1955). A particularly relevant application is Lehmann's analysis of the long-term settlement history of the micro-regions of Crete (Lehmann 1939), where the concept of the *Siedlungskammer* was employed to identify in the landscape 'settlement chambers', as areas within which "*there is usually a single major settlement at any one period, but its precise location is a conjunction of natural geographic opportunities and the specific economic and*

[12] Terraces for agricultural purposes, for instance, are disappearing at a dramatic rate throughout the Mediterranean region, where they have been used since early times (often from the Bronze Age; see chapter I.2.1).

[13] See http://ceres.ca.gov/planning/genplan/sutter/landuse3.html on Sutter county (last visit in September 2008): "*[…] The physical environment is a key component in planning for future county growth since it contributes directly to the perceived desirability of the county as a place to live and work. […] The concept of "physical form" encompasses the physical qualities of a place at different scales: regional, sub-regional, and local. In addition, individual perception of the county's form and character is influenced by context and intent. For example, individual sense of physical form can be influenced by the way a region appears on a map, by sub-regional geographic features observed during automobile travel, or by architectural qualities observed when walking a local neighbourhood street. All three experiences contribute to the sense of the County as a unit*".

[14] Interest is taken in the local landscape character (and documentation of landscape change) for management and planning aiming to preserve the special character and quality of the landscape and the features that contribute to this, to produce a historic landscape assessment and recognise the character of the local countryside and ensure any development would be appropriate to its context. These are, for instance, the main aims of the LCA programme – Bell 1999.

political context of the culture concerned" (Bintliff 2000a: 148). In the earliest topographical accounts on Greek landscape[15], therefore, one can appreciate a proximity between the two disciplines of geography and archaeology. Among them are exponents of historical geography, such as Philippson and Partsch (geographers, not by chance. Philippson –1892- and Partsch 1887 - 1889 – 1890), the aforementioned Lehmann (mainly Lehmann 1939), as well as Kirsten, who edited Philippson's work in 1951. In these works, the description of the past and present landscape focuses on settlement chambers or small landscapes, as far as physical characteristics and organisation of space are concerned.
A good description of both the physical and historical landscape of Greece was given by A. Philippson in his book '*Die Griechischen Landschaften. Eine Landeskunde'*, published from 1950 to 1959 and written in elegantly old-fashioned German, with contributions by E. Kirsten for the descriptions of historical landscapes. Landscape archaeology concepts such as *settlement chambers* (*Siedlungskammern*), *cultural landscapes* and *Kunstlandschaften*, are recognisable in this important precursory work, combining the purely geographical perspectives and narratives with historic-archaeological ones.

In the meantime, the extensive/topographical survey tradition, originated with the travellers (15^{th}/16^{th} century onwards), focused on the discovery and knowledge of the main sites and was characterised by the search of visible remains of sites known from the Greco-Roman sources, without any real regional focus. By the 1960s, far more detailed regional surveys were carried out within a defined area. Their approach was much more diachronical and new locations were investigated together with every previously recorded find spots. The South Etruria survey in Italy (directed by J. Ward-Perkins in the 1950s to 1970s – Potter 1979) and the Messenia survey in Greece (McDonald and Rapp 1972) are well known examples of this kind of extensive regional survey in the Mediterranean area[16].

Soon after, by the early 1970s, a new survey phase had been inaugurated with the intensive field-by-field fieldwalking surveys (the so-called 'New Wave Surveys' - Bintliff 1992c and Cherry 1994), approaching the landscape as a synergy between anthropic and environmental factors and as continuously changing/transforming products of the human-environment relationship in the long term. Research projects work mainly on micro-regions, initially fieldwalking the landscape in search of artefact concentrations (sites)[17], then focusing attention on the artefacts rather than sites, therefore performing an overall (or strategically sampled) covering of the surface with attention paid also to the meaning of off-site material[18]. Those projects gave an increasing importance to the absence of material[19], as well as to the systematic analysis of on-site surface finds (date and functional analysis)[20].
The New Wave Surveys approach the region as the main context within which to carry out fieldwalking and to detect settlement patterns, and they therefore work on relatively small regions, diachronically examining landscape narratives of small landscapes that can be 'hoovered' intensively.

In more recent years there has been a build up in a trend towards comparative studies, and comparison seems to be a thrust in landscape studies based mainly on intensive field-by-field surveys (Cherry 2003; Osborne 2004). For Greece, in 1972 Renfrew had already tried to obtain results from a comparison of landscape and settlement data from extensive/topographical surveys (for the Prehistoric Aegean), while the first attempt at a comparative regional study using results mainly from intensive/New Wave surveys is Alcock's book (1993), which focuses mainly on the Roman period[21]. The challenge of comparing regions is that they are sometimes very different from each other in terms of history and environment, as well as regarding methodologies applied by the research carried out on them (on issues of integration and/or comparison of survey datasets see mainly Van Leusen 2002). A recent work in comparative regional studies is a book entitled *Side-by-side survey* (Alcock and Cherry 2004), which

[15] Mainly represented by the geographical-topographical accounts immediately following (and overlapping) the travellers tradition.
[16] Elsewhere, pioneer is the Willey's 1946 extensive regional archaeological survey project in Peru (Willey 1953), and later well known extensive regional surveys are Adams' research in ancient Mesopotamia (Adams 1958) and Sanders' research in the basin of Mexico (Sanders et al. 1979).
[17] Pioneer projects in this direction in Greece: Melos Survey (Renfrew and Wagstaff 1982); Agiofarango Survey - Crete (Blackman and Branigan 1977); SW Argolid project (Jameson et al.1994 and Van Andel - Runnels 1987).
[18] In the 1980s awareness grew of the limitations of site-oriented archaeology. Among others: Foley 1981; Dunnel-Dancey 1983; Gaffney-Tingle 1984; Rossignol-Wandsnider 1992. Pioneer projects in this direction in Greece: Kea project (Cherry et al. 1991); Boeotia Survey Project 1978-1989 (see Bintliff and Snodgrass publications).
[19] There are no empty or meaningless spaces between sites, and attention is paid to the archaeological record as having a continuous character within a dynamic geomorphological context. It is a notion of landscape as a continuously used space consisting of areas of variable functions and with variable density of archaeological remains.
[20] For an overview up to the early 1980s see Cherry 1984. The main survey projects carried out in mainland Greece to the present day are: McDonald - Rapp 1972 (Messenia); Wagstaff 1982 (Helos plain - Southern Greece); van Andel - Runnels 1987 and Jameson et al. 1994 (Southern Argolid); Bommeljé et al. 1987 (Aetolia); Wright et al.1990 (Nemea); Lohmann 1999 (Attica); Rizakis 1992 (Achaia); Cavanagh et al. 1996 (Laconia); Wells 1996 (Berbati-Limnes, Argolid); Stelios - Kotsakis 1994 (Macedonia); Cosmopoulos 2001 (Oropos); Forbes - Mee 1997 (Methana peninsula); Davis et al. 1997 and Davis 1998 (Pylos); for Boeotia see chapter II.2.
[21] For other smaller contributions to comparative survey studies in Greece, see Halstead 1994 and Bintliff 1997c.

critically and fruitfully compares survey projects taking place in the Mediterranean area from a methodological point of view rather than addressing the comparison to specific historical issues[22].

New Wave Survey projects (field-by-field artefact surface surveys) were thus initially concerned with micro-regions (for both data collection and data analysis[23]), while more recently the tendency is to extract meaningful information, either from the comparison of the results coming from individual surveys still carried out at a micro-regional level or from the comparison of regional trends (see RPC project – Attema and Van Leusen 2004; Attema et al. 2002; Alcock and Cherry 2004; van Leusen 2002: chapter 2). Data collection is therefore focused on the micro-regional level, while landscape and location analysis work at both the micro and macro-regional levels.

In the meantime, the somewhat neglected settlement chamber approach has been developed further, in recent years, by contemporary Czech prehistorians as the 'Community Area' theory (Kuna 1991 and see below), though outside research on Greece. This approach always moves within the New Wave survey framework, emphasising the role of surface data intensively collected and the importance of off-site material. Bintliff applied the approach to the Greek mainland landscape, especially in the work on the Valley of the Muses (Bintliff 1996b).

THE *COMMUNITY AREA* THEORY

The concept of community area (and settlement area), as proposed by E.Neustupny (1991, and earlier in Bohemian/Czech journals[24]), initially created a theoretical framework for the study of Prehistoric communities, but also, in the development of the theory and methods, for the study of landscape regions in the long term.

A community area (or settlement area) is a space where the activities of one community took place (Neustupny 1991, Venclova 1995). Community areas, expressions of past living cultures, are only accessible to archaeologists through the study of the archaeological remains that represent them, which form what Neustupny calls the 'settlement area', the world of dead (archaeological) culture (Neustupny 1994: 248; Neustupny 1991: 327). Thus, the community area approach takes an interest in many areas of the landscape which were not considered to be 'sites', and therefore not of interest within the framework of traditional topographical archaeology, and illuminates the importance of off-site information (presence and absence of archaeological material) from intensive artefact surface surveys.

An archaeological map ceases to describe a landscape possibly filled with individual points representing 'sites', and rather becomes a richly structured space in which only parts are occupied by settlement habitation areas (Neustupny 1994; Kuna 1991). Various sub-areas, representing various activities, can be specified, forming components of the total settlement area: habitation, storage, burial, ritual, as well as production areas, fields, pastures, woodland, quarries, and mines (Venclova 1995; Kuna 2000). Communities performed many different activities which in turn structured the space in which the communities lived. Each of the activities could have occupied a different spatial unit, a different 'activity area' (Neustupny 1991). The various activities are considered within an "*explicit spatial model derived from the behavioural rules of living cultural systems*" (Kuna 2000: 31).

As Dreslerova (1995: 145) points out, the community area approach permits "*landscape to be understood as a series of particular localities (areas), presuming that any part of the landscape in the past had a certain specific function*". Landscape is divided into spatial segments, community areas, which were inhabited by basic economic and social units, ancient (prehistoric or historical) communities (Neustupny 1991 and 1994). Thus, the community area approach focuses on the individuation of settlements exploiting a particular micro-landscape, therefore giving attention to small landscapes within which the main settlement (or cores of habitation areas), and consequently other activities, might show either continuity or shift in location.

Attention is paid to the interrelation of individual components (especially to shifts of the dwelling component within the territory of the settlement area) as well as to their interrelations with the natural environment and the movements of the settlement area as a whole (Neustupny 1994). Groups of community areas were linked into so-called settlement zones, being connected as clusters of community areas within separate parts (referred to as micro-regions[25]) of larger territories, or wider regions (Kuna 1991; Neustupny 1994; Gojda 2004)[26]. Within the community area framework, we assist in the transition from regions or micro-regions towards settlement areas, as a transition from natural/geographical units towards archaeological and historical units, with a considerable change in scale also (Neustupny 1994: 250).

While in the *Landeskunde* tradition mainly environmental factors (availability of fertile land, location of agricultural

[22] The five volumes of the Populus project on *The Archaeology of Mediterranean Landscapes* were already explicitly concerned with comparatively addressing methodological issues: Bintliff and Sbonias 1999; Leveau 1999; Gillings et al. 1999; Pasquinucci and Trément 2000; Francovich et al. 2000.

[23] From the micro-landscape level one would move to the regional level and the wider dynamics at that level, etc.

[24] Neustupny's pioneering article was the 1986 article, '*Sidelni arealy pravekych zemedelcu*' (Settlement areas of Prehistoric farmers), published in *Pamatky archaeologicke* 77: 226-34.

[25] Originally, the term 'micro-region' meant a small sample territory to be intensively studied, rather than a wider territory too large to be studied effectively. The concept was soon underpinned theoretically, receiving the meaning of a definable geographical and cultural unit where various aspects of past cultural systems can be studied (as summarised in Kuna 2000).

[26] See also Dewar 1986 and 1992 for the concept of dynamic settlement systems.

land and crops, presence of water sources) were used to individuate settlement chambers[27], according to the Community Area approach, social and historical variables are also involved in the definition of community areas active in spatially more or less well-defined settlement chambers.
Therefore, the concept of *settlement chamber* does not correspond exactly to the concept of *community area*. The former can be considered more deterministic, while, according to the latter, 'behaviours' of community areas are also strongly influenced by historical/cultural/social factors. In Neustupny's words, the community areas "*cannot exist outside of what they are given by nature, but they are much more than a sum of environmental factors*" (Neustupny 1994: 251). Thus, community areas can also be detected by examining what still remained obscure, at divergences which still remained unexplained, having examined the physical/environmental factors, paying attention to possible social landscapes (for instance, the role and the influence of a *polis* in the area; small landscapes conditioned by the size of the settlement, etc.). As Neustupny (1994: 251) points out, the 'human dimension' of community areas can be studied at three levels: practical[28], social[29] and symbolical[30] (most archaeological entities are characterised by all three dimensions).

Several scholars, even if outside or earlier than the main Czech 'Community Area' school, either explicitly or only in practice, followed and follow the same approach in building up their reasoning on the history of settlement in a particular area. For instance, Heidinga's work (1987) on the lower Rhine area in the medieval period can be considered one of first applications of the approach. Also, as pointed out earlier, Bintliff's article on the settlement chamber of the valley of the Muses (Bintliff 1996b) revitalises the *Landeskunde* tradition with approaches to the shifting of settlement closer to the Czech school.

THE 'SENSE' OF CONTINUITY

In Bintliff's words (2000b: 8), one could say that: "*The strong regularities exhibited in settlement networks of later prehistoric and ancient societies, may emanate as much from human ecological and sociobiological constraints as from the conscious planning programmes of ancient communities"*. On the other hand, we must note how this approach mainly tends to follow the argument that the distribution of fertile agricultural land, ergonomic work constraints on territorial size, social factors affecting the dispersion of communal groups, and limited locational possibilities for settlement micro-location, might appear in the long-term more important than the conscious inheritance of traditional 'senses of place' or continuity of populations and cultures. This might sound "*as a warning against taking to extremes a currently-fashionable trend in landscape archaeology theory*" (from Bintliff 2000a: 148), which mainly emphasises the role of 'memory' in the interpretation of past settlement networks (cf. Barrett 1994; Tilley 1994; Bender et al. 1997), and explains the continuity of residential areas more through the potential continuity of social meanings ascribed to certain places by people, rather than through the formation and maintenance of cultural landscapes through time (Tilley 1994).

Sometimes the settlement chambers[31] are clearly geographically defined (either by physical boundaries – rivers, watersheds - or by the presence of outstanding environmental features – a lake, a marsh, a basin - or by man-made features in particular periods of history), but at other times it is harder to individuate them, and socio-political/historical variables play the most crucial role (see above). Within a community area, continuity of occupation of particular locations in the landscape does not automatically mean that the permanent settlements remain at the very same *locus* for centuries or millennia, but could correspond to a continuous oscillation of residential areas around some focal points in the landscape ('residential cores' - Kuna 2000: 41), which could explain striking long-term continuity. One could hypothesise that once the landscape had been structured by human behaviour, other activity areas (apart from the residential places) must have also retained some stability, as a result either of economic, or of symbolic and ideological reasons (Kuna 2000). The landscape of each period has to be considered as a social, cultural product (interconnected with a set of natural elements) of long-

[27] See, within this tradition, the creation of geographical models (von Thunen 1826 especially on the use of areas in agriculture, Weber 1909 for industrial location and patterns, Christaller 1933 for Central Place theory), then applied also in archaeology (many applications in the wave of New Archaeology). Site catchment theory was also generated within this framework, in archaeology, by Vita-Finzi and Higgs 1970: 1-37. For a review and elaboration of catchment analysis see Bintliff 1999c.

[28] With the 'practical' dimension, Neustupny (1004: 251-2) describes categories of practical activity, such as economic life and the use of facts as carriers of meaning and significance. At least some of the economic activities concentrated into particular areas, to be detected also by means of the non site-oriented archaeology. The practical activity of a community within its settlement area must frequently have gone beyond the self-regulation capacity of natural resources (see, for instance, the crisis at the end of Classical/Early Hellenistic period in Greece described in van Andel and Zangger 1990, Bintliff 2002 among others).

[29] "*The structure of each settlement area has a meaning which can be formulated in terms of the* social organisation *of the community which settled it, i.e., in terms of the interrelationships of individuals and their groups*" (Neustupny 1994: 252). Community areas represent the space within which social activities and relationships take place.

[30] "The structure of each settlement area may have some significance which can be formulated in terms of ideology adopted by the community that settled the region" (Neustupny 1994: 253). For instance, the location of dwelling areas had a certain function (linked to practical factors), a certain social meaning, and a certain significance (i.e. a set of ideological ideas related to that sphere of human activity).

[31] From now on in the volume the term 'settlement chamber' is used much more in the sense of the 'community area' of the Czech school, rather than recalling the 'settlement chamber' of the *Landeskunde* tradition.

term diachronic stability (Kuna 2000: 41) spaced out by radical/abrupt changes/shifts, due to some particular environmental, political, social, or economic factors that put an end to the 'continuity'.

To sum up, the application of the community area theory, which aims mainly to recognise possible shifting of the main nucleated settlement (towns and villages) within each 'chamber', implies a sort of 'continuity' of settlement at or beside the occupation of the previous phase. The examination of a small landscape, and especially of the continuity or shift of main settlement and other activities within it through time, would allow us to 'narrate' the story of the small 'chamber', without taking for granted stability of landscape conditions or of economic or social factors (obviously changing through time), and without 'idealising' continuity with the attempted emphasis on the role of memory, but rather focusing on recurrent natural and cultural factors and/or characters, which could be of a different nature[32]. As Bintliff (2000a) points out, a 'pragmatic' choice of place, (while avoiding being too deterministic), seems to appear more important than the conscious inheritance of traditional 'senses of place', or continuity of populations and cultures[33].

As an alternative, Bintliff (2000a) would suggest recent developments in scientific thinking, in particular complexity theory and non linear system theory which, giving emphasis to the concept of 'strange attractors', considers not only small variations – due to cultural choices - that could lead to major changes, but especially the recurring of situations due to recurring of 'initial conditions' (i.e. small variations)[34]. It recognises the importance of 'anomalies' and tries to deal with them instead of considering them as simple biases in the dataset (see Lewin 1993, Bintliff 1996a, as well as Spencer-Wood 2000, Stewart 1989: 268ff. For archaeological examples and models: Zubrow 1984, Spencer-Wood 1996, Reed - Harvey 1992; van der Leeuw - McGlade 1997, Bintliff 1996b, Uleberg 2004: 444, as well as McGlade 1995).

DEFINING MICRO-REGIONS AND SETTLEMENT AREAS

The aim of regional studies is to identify similarities and contrasts within a single landscape unit across time in order to analyse and interpret the history of the landscape[35]. The need of diachronic studies for the interpretation of landscape behaviours aiming at a landscape narrative is therefore evoked (see, among others, Neustupny 1994: 254). Thus, landscape archaeology cannot but adopt the time perspective of '*long durée*' (Braudel 1980), and any attempt to understand past societies must take into account the preceding and successive uses of the landscape within a landscape unit, occurring before and after the society under investigation.

Therefore, the main problem in regional studies becomes that of discovering the presumed unit of research in the archaeological record and defining its dimensions. As Kuna points out, "*the theoretical definition of the community area does not itself tell us anything about the expected size of the community, the number of its habitation areas, and the space belonging to them. It works, however, from the logic of the concept that a community area must be identified with such a minimal spatial segment of space (such a cluster of sites) within which the occupation can be supposed as continuous from the diachronic point of view and where the range of different activities is relatively complete (at least in the sense of activities that can be archaeologically traced)*" (Kuna 1991: 340-342)[36]. This works for areas that can be covered or sampled through intensive and systematic survey work. When these data are not available, and the archaeological record is constituted by palimpsests of data, based on information collected through time, within different research frameworks, and usually not systematically collected, as in the case of the present work, the application of the model is slightly different. It is focussed on the structure of settlement rather than on the mapping of every locality and its exact extent, and takes into consideration the poor information available and the characteristics of the landscape during time

[32] For instance, a site in a particular period might sometimes be located exactly at the same spot where it was in previous times due to geographical locational advantages, but the fact could also be due to the presence of previous investment in land clearance, terracing, building stones and rubbish/manuring for vegetable gardens, etc.

[33] Sometimes, even if populations living in an area vary, the location of the main settlement or other activity areas continues to be the same (see Bintliff 2000a for the case of post-antique Boeotia).

[34] According to the complexity theory, "*potentially highly variable and historically very specific agglomerations of elements show recurrent tendencies towards systematic patterning of a complex form, as the result of the operation of factors which are 'enabling and constraining' (the 'strange attractors' which produce order out of chaos)*" – Bintliff 2000a: 148.

[35] As seen above in the text, attention to the micro-region is, in the study of the Mediterranean landscape, the desire to enhance and examine small diversities among regularities (Cherry 2003; Alcock and Cherry 2004; Osborne 2004).

[36] This works for areas that can be covered or sampled through intensive and systematic survey work. When these data are not available, and the archaeological record is constituted by palimpsests of data, based on information collected through time, within different research frameworks, and usually not systematically collected, as in the case of the present work, the application of the model is slightly different. It is focussed on the structure of settlement rather than on the mapping of every locality and its exact extent, and takes into consideration the poor information available and the characteristics of the landscape during time (physical and cultural), and later historical (Frankish-Ottoman) or modern landscape for which the record is less incomplete, or complete in the case of the modern village system, rather than the actual distribution of activities in the landscape for which we have only poor information (burial areas, sanctuaries, rural and production activities, etc.).

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As seen earlier, sometimes the micro-landscapes are well defined by physical constraints, while in other cases borders are fading and only cultural elements or meanings would define and mark the border line between the territories of two communities. Working within the community area framework, archaeologists should develop the ability to detect the presence of settlement areas with sufficient accuracy, while keeping in mind that in addition to function (easier to define), meaning and significance, random decisions of individuals will also play a role. As stated by some proponents of the theory, the concept of community area and the presumed rules of distribution and co-occurrence of certain phenomena would allow us to make generalisations even from fragmentary data (Kuna et al. 1993), from an archaeological record that is naturally incomplete.

Despite the fact that, as Ingold points out (2000: 191), the concept of landscape is qualitative rather than quantitative[37], and one can ask of a landscape what it is like, but not how much of it there is, boundaries of various kinds may be drawn in the landscape. They do not segment the landscape, for the features with which they are identified (either natural or anthropic, a river, an escarpment, a watershed, a defensive wall, etc.) are themselves, in theory, an integral part of it. They can also become a boundary, or indicators of a boundary, in relation to the activities of the people for whom they are recognised or experienced as such (Ingold 2000: 192-3).

In his contribution to the book (edited by Renfrew and Zubrow) on cognitive archaeology, Bradley (1994) criticises the studies of landscape history which are concerned "*with the organisation of fixed resources and presuppose the existence of a network of recognisable boundaries*"[38]. He quotes Tuan 1977, who states: "*The recognition and differentiation of landscapes does not seem to be an old or common human trait*", pointing out how in pre- and non-literate peoples nature is recognised in local objects (plants, animals, rocky prominences) or in generalised phenomena (sky, moon, earth, water, etc.). On the other hand, among literate peoples, "*the reading of significance into arbitrarily selected spatial units of nature is remarkably rare*". In the case of the Greek *polis* territory, the relationship between city (and citizens) and land was so close that boundary definitions become desirable (boundary inscribed stones – *horoi* -, treaties, etc.). In fact, this can be due to the tremendous value given to land by farmer societies, which, from the beginning, define agricultural territories by enclosing them. On the other hand, the territorial behaviour is very complex, and can be seen as working even in earlier societies[39], such as hunter-gatherer groups, who perceive their territories by monitoring the paths running between specific places, living in the landscape with its original objects and features.

THE CONCEPT OF *TASKSCAPE* FOR A RENEWED APPROACH TO THE LANDSCAPE

In the last decades, research in cultural anthropology has been emphasising material worlds and meanings worked out through material culture and landscape. Time and landscape, states the cultural anthropologist Ingold (2000: 189), are the essential points of contact between archaeology and anthropology.
While discussing the concept of landscape, Ingold (2000: 190-3) states how the forms of the landscape are not prepared in advance for creatures to occupy (and the landscape is not a neutral box in which life and actions take place), but both physical and human landscape forms are generated and sustained in and through the processual unfolding of relations and the continuous mutual transformations (see also Ingold 2000: 193 and Goodwin 1988). It is in the very process of 'dwelling' that these forms are constituted, as Ingold (2000: 199) points out, quoting Heidegger's remark "*to build is in itself already to dwell*" (Heidegger 1971: 146). The landscape therefore always has the nature of a work in progress.
Just as landscape is not a passive, neutral box in which human actions occur, space and time are not passive, abstract media in which action occurs, but are themselves created through social acts (Munn 1990; Gosden 1999: 158). According to Munn[40], the regional world is not given but lived, and history is the temporal aspect of regionality. Regionality is therefore created in experience, it is a temporal as well as a spatial construct, and regions are the lived landscape, lived spaces whose character is given through action and material culture (Munn 1990).

Once again, evident here is the intimate correlation between the concepts of landscape and regions, space, time, temporality and history. These are all concepts that will help us in the definition of a particular approach to past landscapes.

We can move further, by referring to the phenomenological 'dwelling perspective'[41], according to

[37] Unlike the concept of 'land', which is quantitative rather than qualitative.
[38] Bradley (1994) would consider as required a *more flexible archaeology of place*, as the landscape is a wider concept than that of land/territory.
[39] See the classic paper by Dyson-Hudson – Smith 1978.
[40] Nancy Munn, who works on communities on Gawa island (Papua New Guinea).
[41] The 'dwelling perspective' was formulated by Ingold, inspired by Heidegger, and then influenced by Bordieu (1977). The work of Bordieu has been crucial in inspiring much anthropological and archaeological research that stresses the importance of the mutual involvement of people, material culture and landscape. For details of the concept of 'dwelling perspective' (inspired by Heidegger), see Ingold 2000: 185-7.

which the landscape is constituted as "*an enduring record of – and testimony t o- the lives and works of past generations who have dwelt within it, and in so doing, have left there something of themselves*" (Ingold 2000: 189). Ingold's 'dwelling perspective' is given a spatial dimension through his image of taskscape, which is seen as an array of related activities spread across the physical landscape (Ingold 1993: 158). The idea of taskscape (formalised by Ingold 1993 and 2000) gives emphasis to the role of human actions within the landscape, but also helps to emphasise the role of time and history in landscape analysis. As noted by Gosden, "*activities which are separated in space must also be spread out in time and each taskscape has its own temporality, its rhythms of action and of rest*" (Gosden 1999: 128). An activity carried out in one place "*refers explicitly or implicitly to a host of others carried out elsewhere*" (Gosden 1999: 128), and acts are therefore not isolated, but link into complex chains creating a sense of space and of time, which would constitute what we usually call 'landscape history'.

The temporality of the taskscape is essentially social, not because each task is carried out within a framework given by society, but rather because, in Ingold's (2000: 196) words, "*people, in the performance of their tasks, also attend to one another*" (by watching, listening, touching one another and the physical or 'built' landscape features), therefore acting socially. The taskscape exists not just as activity but as interactivity (Ingold 2000: 199). The passage of time is primarily the succession of tasks and their relations to one another. The taskscape must be populated with beings who are themselves agents, therefore giving emphasis to the role of human and social agency[42], realised by humans making choices over the landscape (see chapter I.2.2 for an illustration of the concept in terms of human behaviour over the landscape).

According to Ingold, the forms of the landscape (see above – definition) carry signs of the tasks executed in particular areas, and therefore landscape becomes an 'embodied' form of the taskscape (Ingold 2000: 198)[43]. In a less theoretical and less holistic view, one could say that different landscapes (i.e. different forms of landscape) carry signs of different taskscapes (different forms of taskscape) evolving in the temporal dimension. In Inglis' words, "*a landscape is the most solid appearance in which a history can declare itself*" (Inglis 1977: 489). In Ingold's view, the taskscape is the temporal dimension of the landscape (Ingold 2000: 200). By using the word in the plural ('taskscapes') one could define the different temporal forms of landscape, or landscape characters. This might correspond, in other words and within a different theoretical framework, to the issues expressed in the framework of the community area theory.

In addition, the relational view of the anthropologists Marilyn Strathern and Roy Wagner (Strathern 1995) stresses the concept of continuity, when some transformations (which occur as the relations between people and things shift) are regularly occurring ones, opposed to the concept of change, when some transformations are unexpected and bring about new sets of relations (Gosden 1999: 121). The consideration of continuity can be linked to the community area long-term analysis and to the diachronic perspective which inform regional archaeological landscape studies, as well as to the 'sense of continuity' discussed above. Landscape archaeologists try to identify a series of cycles, which build themselves into the forms of the landscape (see above).

To summarise, historical geography, and the *Landeskunde* tradition, was concerned with settlement chambers due to their interest in the main settlements and their territories. Afterwards, the Community Area school also showed interest in settlement chambers, but this time due to interest in activities and the distribution of activities in the landscape. On the other hand, the Taskscape approach may also concern settlement chambers, as it considers the different areas of activities in the landscape, calling them all 'dwelling' (in the Heideggerian sense), and therefore also includes the actual activity of inhabiting, as well as all the other human activities.

Settlement chambers, community/settlement areas and taskscapes can all be considered concepts belonging to the same reasoning on landscape history and narratives, having as a basis the landscape as a social space, although expressed in different ways and with slightly different implications, and generated within different disciplines (archaeology with a strong influence from geography on one side, anthropology reasoning on archaeological and material culture issues - space and time - on the other). These concepts form the background on which my approach to the Boeotian landscape is based. It gives focus to the micro-region, enlightening the role of landscape character, as a result of the association, transforming through time, between landscape zones and activities within a wider region (see earlier, the revitalisation of landscape character in historical landscape management and Ingold's notion of landscape forms), and it re-proposes the settlement chamber approach born within the *Landeskunde* tradition, renewed and revisited with demanded modifications through the community area and taskscape approaches examined above[44].

THE USE OF GIS IN REGIONAL LANDSCAPE STUDIES

The use of GIS by archaeologists for research on regional or 'wide-area' contexts, is strictly related to Landscape

[42] For a definition of agency, see Johnson 1999: 189 and Tilley-Shanks 1992: 122-6.

[43] Other anthropologists point out the necessity of isolation of potential landmarks associated with specific activities in the landscape (Stewart and Strathern 2003).

[44] The theoretical approach illustrated in this chapter constitutes the theoretical basis of the whole thesis. In chapter I.2.2 the application of it to my work is discussed.

Archaeology[45], mainly adding new 'technological ways' to satisfy the needs of the theoretical background belonging to the discipline, but pushing itself towards new approaches. The main GIS applications in regional archaeology include mapping, manipulating historical maps and remote sensing data, predictive modelling, processing of survey data and sampling techniques, analysis and simulation of physical and cultural landscapes, and landscape visualisation. These can differ in the type of data involved (collecting and recording phases of GIS), in use, framework and aims (management and analysis phases of GIS), and in data presentation and visualisation (presentation phase of GIS)[46].

Regional archaeological GIS involve different types of data, such as vector and raster data (often integrated), remote sensing data, historical maps, survey data and interdisciplinary information (data coming from different disciplines). For the purpose of this work, the use of survey data and interdisciplinarity within GIS will be focussed upon.

Some GIS projects map and apply analyses of spatial and archaeological data from the bibliography and from local archaeological records (known sites, known environments, known materials). In most of these cases, GIS can help in integrating diverse datasets and make the use of existing non-systematically collected data more objective and monitored. In addition, GIS is strongly used in processing data collected by intensive artefact surface surveys in a systematic way. It provides an environment within which one is able to explore in its entirety the regional surface information and, therefore, to critically and reflexively evaluate issues such as complex relationships between ceramic density and identification of sites[47].

A hallmark of fully-realised GIS is interdisciplinarity. Knowledge and information coming from related disciplines can be inserted into the system and analysed along with archaeological data. Thus, data produced by other scientists (especially geomorphological and environmental layers, as well as maps resulting from land evaluation) can also be profitably introduced, thus reflecting the complexity of the landscape. Hence, archaeological GIS often include analyses typical of earth-sciences, such as terrain modelling[48], slope and aspect determination, hydrogeological modelling (see below), watersheds detection[49], terrain dynamics, etc.

The GIS ability of integrating diverse landscape datasets led many researchers to employ it as an environment within which to explore and evaluate the correlation between archaeological parameters and the physical landscape. GIS applications have therefore been associated with a risk of 'ecological (or environmental) determinism' (Gaffney and Van Leusen 1995, Kvamme 1997, Wheatley 1998), as well as with the tendency to forget and/or exclude cultural aspects of the landscape as well as historical factors and social variables which would have had a significant effect on how the landscape was used and perceived. This soon resulted in an increasing involvement of 'cognitive'[50] variables in location analysis and predictive modelling (Kvamme 1999: 182), and European researchers began to focus on the incorporation of social variables into their predictive models as well as in spatial and locational analyses (Wheatley 1996; Stančič - Kvamme 1999; several papers in Lock 2000). In order to do this, they incorporate for instance qualitative evidence derived from oral history and ethnographic studies (Pilon et al. 1997), they infer some cultural parameters from historical sources and archival documents, which could be either included into the GIS as cognitive landscape parameters (mainly

[45] This involves the study and reconstruction of complete past landscapes, and places the emphasis on the relationships between sites and their environment, rather than on individual sites as 'islands' within a landscape (Lock 1998).

[46] Since the late 1980's, GIS has gained popularity in Archaeology. The volume edited by Allen, Green and Zubrow (Allen et al. 1990) marked a crucial phase for the young discipline, opening its potential to the academic archaeological world. Since then there has been rapid growth in the application of GIS techniques, as a tool both for Cultural Resource Management (CRM) and for academic research. In 1995 Lock and Stančič published a European reply to the American work (Lock - Stančič 1995). Over the last decade, a growing awareness of the potential of GIS is evident from the publication of an increasing number of both practical case-studies and theoretical investigations. Important, especially for the critique of the use of some GIS routines, is the work of M. van Leusen (published in several articles and then combined into his PhD dissertation, Van Leusen 2002), as well as the manual 'Spatial Technology and Archaeology' by Wheatley and Gillings (2002). Also worthy of consideration are the CAA (Computer Applications in Archaeology) conference proceedings, published annually since 1973, and including GIS since the late 1980s, as well as the books edited by Lock (2000) and by Mehrer – Wescott (2006), and the recent book on Geographical Information Systems in archaeology by Conolly and Lake (2006).

[47] There are several examples of GIS-based survey studies in the Mediterranean area. Greece: Boeotia (Gillings and Sbonias 1999; Bintliff and Howard 2000), Aetolia (Bommeljè et al. 1987; Doorn 1993), Achaia (Simoni – Papaiannopoulos 1998; Petropoulos-Pontrandolfo-Rizakis 2004) and the Patras region (Rizakis et al. 2001), Kythera (Broodbank 1999; Bevan-Conolly 2002-2004), Corinth (Romano-Tolba 1996; Gregory 1998), Thessaly (Helly 1998), Crete (Phaistos – Watrous et al. 2004). Cyprus: Given – Knapp et al. 1999 and Given – Knapp 2003. Italy: Tuscania (Vullo and Barker 1997), Tiber Valley (Patterson - Millet 1998), Agro Pontino (Kamermans 1994; Attema 1993), Potenza Valley (Vermeulen 2002 and 2003), RPC project in Southern Italy (Attema et al. 2002; Van Leusen 2002 and 2004); Turkey: Vanhaverbeke - Waelkens 2003, Lycia (Hailer and Martin 1998).

[48] The use of modern terrain morphology to represent its past versions has been subjected to much constructive criticism, allowing it to proceed with more careful use. On DEM (digital elevation model) interpolation methods and biases see for instance: Beex 2004 and Farinetti – Sigalos 2002; on DEM quality for viewshed analysis see: Van Leusen 2002: chapter 6; on investigation for archaeological purposes of the 'topographic fabric' see: Duke 2003 - CAA2002.

[49] For an archaeological application see Bevan 2002 on Crete.

[50] See Renfrew and Zubrow 1994 for 'cognitive processualism'.

landscape visibility and accessibility involved in analyses such as visibility and cost surface analysis – Gillings and Wheatley 2002, Van Leusen 2002: chapter 6 – to explore past cognitive landscapes) or taken into account during the performing of the analysis (see below).

Archaeologists have been accused of using GIS 'as little more than a mapping system' (Goodchild 1995: 46). In fact, some work uses GIS simply as a method for computerising cartography, combining disparate datasets with speed and accuracy (thanks to the multiple layer logic of GIS). If often studies do not go really deeply into the analysis, it is also because there are a considerable number of applications[51] that emphasise the mapping capabilities of GIS rather than its analytical functionality (this has been pointed out by many authors; see, for example, Gillings and Wise 1999). Therefore, while any definition of GIS will undoubtedly emphasise analytical capabilities, it must be recognised that in some respects a major strength of the software lies in its ability to integrate and manage large and diverse datasets (Gillings and Wise 1999, Vermeulen 2001). The risk is to create just a more sophisticated and attractive version of the old-fashioned 'Archaeology of dots'. On the contrary, the strength of GIS environment is that the dots can become meaningful within the system, being attached to incrementally higher levels of information.
Certainly analyses can differ according to the theoretical archaeological background followed, and also depending on the data-type involved in the GIS. In the case of Regional Archaeology, spatial and location analyses of settlement and landscape features can be carried out within a GIS system (see below), as well as analytical procedures helping the detection and interpretation of ancient landscape dynamics.

As stated earlier, much work identifies the risks of 'environmental determinism' (Limp 1997, Stančič et al. 1997, Given et al. 1999), and scholars either try to find a solution for it (Favory and Van der Leeuw 1998, Given et al. 1999), or they claim the urge of new GIS models designed explicitly for socio-cultural rather than geophysical processes (Verhagen et al. in press)[52]. Some try to integrate current theoretical notions of landscape within GIS functionalities involving various ways of effectively humanising the landscape, stressing the perception of the landscape itself by people living in it in the past. As Gillings and Wise (1999) point out, these approaches initially attempted to comment on the perception and cognition of an individual situated in the landscape based on visibility and intervisibility studies involving line-of-sight and viewshed routines (for example, Gaffney *et al*. 1995; Wheatley 1995; Lock and Harris 1996; Van Leusen 2002: chapter 6). Further steps in this direction are various perception-based approaches (Llobera 1996), the reconstruction of landscape dynamics (Gillings 1995, Budja and Mlekuz 2001), and the integration of Virtual Reality into the GIS systems (Gillings – Goodrik 1996; Forte et al. 2003). In the last decade, several studies have also appeared concerning the application of agency concepts within the GIS analytical environment (Van Hove 2003; Llobera 1996). In contrast, the analysis of cognitive phenomena over a landscape, if overstating 'human' and cultural aspects of the landscape, such as symbolic or mental factors, can also lead to an abuse of phenomenological explanations.
Different kinds of locational and GIS analyses are often performed within GIS systems: thematic mapping, Thiessen Polygons, Nearest Neighbour Analysis, Quadrate analysis and Location Models, different kinds of statistical analysis, geostatistics[53], Network analysis, Modelling techniques, buffers[54], as well as predictive modelling[55]. I will describe here briefly two typical GIS analyses that can be useful for cultural considerations on past human behaviours and involve cognitive landscape parameters, such as landscape accessibility and visibility: Cost-surface analysis and Visibility/Viewshed/Line of Sight analysis.

Cost-surface analysis: as an improvement on buffers based on straight-line distance, catchment areas, usually investigated through circular or other-shaped buffers, can be weighted, within GIS, taking account of topography, therefore calculating not only straight-line distance but walking-distance or time-distance. A module to calculate such a relative cost-surface using the DEM is included in most GIS packages. It models the cost of moving through space, where costs are a function of both the standard costs associated with movement, and also of frictions and forces that impede or facilitate that movement (see, among others, Stančič et al. 1997; Llobera 2000; Van Leusen 2002: chapter 6; Gillings 2002: 151ff.; Pizziolo-De Silva 2004; Howard 2007). From the cost surface one can perform the shortest path analysis, leading to the simulation of ancient paths (among others De Silva-Pizziolo 2001: 284-5; Podobnikar et al. 2004). In some GIS work, the sites or activity *foci* employed in cost-surface analysis are differentially 'weighted' (Llobera 2000: 74; Van Leusen 1993 and 2002: 6.8). By means of these analyses, the relationship between man and the topographical environment can be examined, and physical and perceptive movement through the landscape investigated (Llobera 2000; Van Leusen 2002: chapter 6).

Visibility/Viewshed/Line of Sight analysis: marks a step in the direction of understanding the ancient perception of

[51] Sometimes referred to as *desktop mapping* software.

[52] A session was organised at the EAA 2004 congress by J. Chapman and B. Gaydarska, with the title: *How GIS can contribute to a social archaeology?*

[53] A particular form of statistical analysis particularly performed within a GIS environment and in GIS-based landscape studies (see for instance Barceló - Pallarés 1998:65 and Van Leusen 2002: 5.15).

[54] Buffer analysis is used to investigate catchment areas or areas of interest around a point, polygon or along a line feature.

[55] For predictive modelling see Kvamme 1990, and, among others, Verhagen et al. 2000, Van Leusen and Kamermans 2005, Velianovski and Stančič 2006. Although North American archaeology has the most experience with this technique, several recent European applications show its potential for regional archaeology (for the latest applications see Kamermans 2000; Verhagen and Gazenbeek 2006).

the landscape, through the identification of sites in viewsheds from both culturally and naturally defined points in the terrain. A viewshed is all the locations that are capable of being seen from a defined location or locations. The GIS uses elevation data (potentially with additional layers such as vegetation, structures, etc.) to compute line-of-sight. A refinement of this is in the distinction between the absolute visibility (probable viewshed) and the level of clarity (fuzzy viewshed) with which a site is seen. Another development is the interrelation between the visible and the accessible landscape. For reference see, among others, Van Leusen 2002: chapter 6; Gillings 2002: 151ff.. European archaeology has greatly developed this kind of analysis in order to explain complex social processes (relatively early examples are the work in Brač -Stančič et al. 1997- and in Kars -Novakovič 2001). For the concept and applications of cumulative viewshed analysis (viewsheds from a set of features), see among others: Wheatley 1995 and Van Leusen 2002 (chapter 6).

The GIS environment can help the refinement, re-thinking and re-application of traditional categories and thematics that have characterised Regional surveys and Settlement pattern studies: upland-lowland dynamics, agricultural practices and pastoralism, rural-urban interactions, nucleated vs. dispersed settlements, resource control, social stratification, development of complex societies, spatial patterning, recognition of boundaries between cultural groups, and recognition of the boundaries of large diffuse sites. An increasingly important role in Regional Studies is played by the anthropic and cultural variables of ancient settling dynamics, the perception that ancient people had of the surrounding natural environment and cultural *milieu*, and their relationship with the perception of time and space (spatio-temporal dynamics).
Many GIS practitioners and theorists argue that GIS technology has already began to reach maturity and archaeological GIS-based studies are now beginning to interrogate themselves, finding their own voice and identity and developing a reflexive body of theory. Moreover, quite a number of archaeologists believe that GIS is slowly revolutionising the way in which archaeology is performed, and that having used GIS it is impossible to return to other methods (e.g. Gaffney - Stančič 1991: 29-32). I agree with this: it forces one to rationalise data, to clarify one's thoughts and aims in order to be able to instruct the computer in a structured way, to collect data in an appropriate, adequate, organic and structured way. I would support an interaction, a continuation of old methods together with the new, as if they were two versions of the same reality. However, the use of GIS should not determine the nature of the research. The research questions of landscape evolution and transformation must come first, and GIS must at best be a tool to carry out such research.

The present research can be considered GIS-based in the sense that a GIS was the framework within which the landscape physical and cultural data have been collected and managed, and later analysed and presented. Within this framework, the construction of the archaeological dataset was, to a certain extent, led by the inner properties of the GIS system, which certainly informed, as a way of thinking, the information source critique process and helped in the structuring of the archaeological record in a coherent and consistent manner while maintaining the resulting archaeological datasets adequately flexible (see chapter I.2.2). On the other hand, the chosen approach to the landscape also plays a key role in the construction of the datasets, as well as in the analysis and interpretation processes. I would say that within the GIS environment, the approach to the landscape as described earlier in this chapter became practice, leading to the enucleation of location choices of past communities over the landscape, as well as to the association between landscape zones and activities, resulting in landscape characters, and to the exploration of cultural landscape meanings and settlement behaviours (see earlier in the chapter and chapter I.2.2).